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ATTENDANCE AT IEEE INSTRUMENT SHOW AT NEW YORK, MARCH 23-26, 1965

by

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Each year in conjunction with the International Convention of the Institute of Electrical and Electronics Engineers, leading instrument and component manufacturers and suppliers take part in an instrument show at which the latest developments are demonstrated. This provides a concentrated assembly of electronic and electrical hardware and represents the one occasion at which individuals and organizations involved in the field can view and compare the available equipment. The main purpose of the visit was to survey the more than 1200 displays but arrangements were also made to spend a day at the Bell Telephone Laboratories Inc., Murray, N.J., in order to discuss topics of special interest.

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IEEE SHOW

The instrument show was held mainly in the New York Coliseum with a few displays in the convention hotel, the New York Hilton. Although the two are not far apart, a bus shuttle service was maintained by the International Rectifier Corporation – a worthwhile convenience, especially in wet weather. The Hilton display was small and generally limited to those companies which were exhibiting for the first time.

In order to extract as much information as possible, the authors made lists of the companies to whom specific questions were to be directed after which the remaining booths were visited. Two people working independently and at a rapid pace can cover the displays in three days. However, this leaves little room for detailed discussion which can consume a considerable amount of time and yet is often necessary in order to clarify manufacturers claims.

Generally speaking, the displays were oriented toward production rather than research. In the case of machines, these were for the most part geared to perform, automatically, many common operations and there were few cases where a machine was displayed which could be classed as a research tool. Such items as wire saws, special bonding machines etc., were not in evidence, although one crystal puller and one electron beam zone melter were demonstrated. On the other hand, electronic test equipment is common to both production and research and it was from this area that the greatest benefit was derived.

It was evident that some companies sent sales representatives to man the booths rather than their development engineers. This was unfortunate; although the salesmen were well acquainted with the broad capabilities of their wares, they were not always completely aware of details of interest to the customer. There was a tendency also to invite further enquiries rather than discuss equipment on the spot. In some cases this proved to be useful, but for the most part little additional information is obtained beyond that available from advertisements in trade magazines. One feature that did become apparent was the lack of communication between the Canadian representative and ourselves for many lines in which we are interested.

In addition to a survey of the show, contact was made with Reeves Soundcraft in connection with the testing of ferrite powders, Mr. R.C. Linares, Perkin-Elmer, Norwalk, Conn. regarding ZnS growth, and Hofman Laboratories Inc. for information on liquid helium dewars for use with the Beckman DK 2A spectrophotometer.

A short discussion also took place with a sales representative of Semi-Elements Inc., who have supplied Mineral Sciences Division with synthetic ZnS crystals. After some comments on the quality of the single crystal material the representative admitted that there had been a problem with quality control. The possibility of examining their materials with crossed polaroids had not occurred to them and they felt that this would be a good method of quickly evaluating the crystals. At present this is done by X-ray techniques only. The salesman was unfamiliar with the question of iron

doping in order to promote growth of single crystal ZnS but fell in with the suggestion that the iron was added as FeS at the time of growth.

It is possible that the quality control will be more effective in the future provided the crystals are examined for birefringence prior to sale.

Ferrite Testing

Reeves Soundcraft – Mr. E. Schmidt

Prior to attending the IEEE conference, correspondence had taken place between Mineral Sciences Division personnel and Mr. E. Schmidt of Reeves Soundcraft on the subject of testing and evaluating ferrite powders. As a result of this correspondence, a meeting was held between representatives of Reeves Soundcraft and the authors to discuss methods of testing these powders.

Mr. Schmidt described a simple and reproducible method of evaluating the powders which were obtained from Hercules Powders Co., Glen Falls, N.Y. (Imperial Colours and Chemical Division, Mr. Robert Stevens). The procedure consists of placing the powders in a test tube, tapping 20 times on a cake of soap, and inserting the tube in the test coil of an Atlanta Scientific B-H Measuring Instrument (1000 gauss – $8,000). The powders as obtained were less than 1μ in size and were further processed by Reeves to obtain the desired characteristics. The powders were tested at each step in the process including the final one which consisted of powder dispersed on tapes. The method appears to be simple and straight forward.

A conversation held the following day with representatives of Arnold Engineering elicited the information from a man who had been in the ferrite testing field for 25 years, that there was no known way of testing powders per se, and that it was necessary to form a pressed compact. A colleague however, did suggest that the powders could be tested by forming a core of powder dispersed in a medium such as paraffin.

It appears that there is some disagreement among the experts on the question of evaluating ferrite powders.

Perking-Elmer – Mr. R.C. Linares

A telephone conversation was held with Mr. Linares regarding the growth of ZnS single crystals. Mr. Linares stated that he has now developed a new process for preparing single crystal cubic phase zinc sulphide which yields crystals up to 5 mm on a side and of the order of 1 mm thick. These are colourless and show no birefringence under crossed polaroids. He has performed optical absorption experiments and reports the presence of a strong absorption peak at about 7000 Å which is attributed to the presence of copper. His crystals are analysed by atomic absorption, and he is quite certain his absorption peak is not due to iron. He offered to send us 1 or 2 samples and to put on a production run which would yield a number of similar crystals for $250 - $300. It appears that a visit to his laboratories by those working in this field at the Mineral Sciences Division would not only be welcomed but would also be mutually profitable.

Hofman Laboratories Inc. Newark, N.J. - Mr. W.G. Hendrixon

Mr. W.G. Hendrixon, Manager, Research Equipment Department, Hofman Laboratories Inc., was contacted by telephone in order to ascertain the availability of liquid helium dewars for the Beckman model DK 2A spectrophotometer. It is considered advantageous to take absorption spectra at low temperatures and the most direct approach is to adapt existing equipment. Mr. Hendrixon confirmed that Hofman had supplied laboratories with a custom dewar designed to fit the DK 2A. He agreed to forward drawings of the dewar and quoted a price of $2,000 with 4 to 5 weeks delivery.

BELL TELEPHONE LABORATORIES INC.

The purpose of the visit to the Bell Telephone laboratories was to discuss optical absorption measurements and several selected topics in the field of semiconductor technology. Dr. D.L. Wood spent some time discussing optical absorption measurements; Dr. J.H. Wernick related his interest in transition element rare-earth compounds and Dr. Carl Thurmond described his work with GaP.

Optical Absorption

Dr. D.L. Wood started with a tour of his laboratory which is well-equipped with a range of spectrometers and is involved in analytical work. Although it appears that the prime responsibility of the group is analytical, a considerable amount of fundamental research on the optical properties of emerald and ruby has been performed.

Dr. Wood demonstrated his low temperature dewars and in particular the ones employed with the Cary spectrophotometer, which is similar to the Beckman DK 2A. For a quick experiment he uses an ordinary double-walled glass dewar equipped with windows and filled with liquid hydrogen; this takes the sample down to 20°K and is often adequate. Liquid helium experiments take a long time to perform and are considerably more difficult. His sample holder was very simple and cooling was achieved by immersing the bottom of the brass holder in the liquid hydrogen. Provision was made whereby the sample could be removed from the beam without removing the main holder. The Cary is a double beam spectrophotometer and the reference beam travels a normal air path. Dr. Wood pointed out the importance of using a dispersed beam for absorption measurements in order to limit the heat absorbed by the sample. He noted that in one case when this was not done the sample temperature was 100°K while the holder was at 4°K. The dewars for liquid hydrogen were obtained from H.S. Martin.

An Andonian Associates detachable tail dewar had been purchased at a cost of $3,000. This is a very satisfactory instrument and was recommended since it is guaranteed and was actually tested with liquid helium before shipping. Dr. Wood knew of the Joole-Kelvin 20°K refrigerators and, although he has not used them, he felt that they would be very good.

Some discussion on interpretation of optical absorption spectra took place. Dr. Wood was not familiar with ZnS spectra but showed some

interesting absorption spectra of emerald. Apparently water can become included in the structure, depending upon the growth conditions, and its presence is pronounced in the spectra. The jewellers make a distinction between "cultured" and "synthetic" emerald and the distinction can be confirmed in the laboratory. Natural and "cultured" emeralds both contain water in the lattice, while "synthetic" emeralds do not. The difference results from the different methods of preparation.

Transition-Element Rare-Earth Compounds

Dr. J.H. Wernick explained that his interest in binary compounds involving the transition elements and the rare earths stemmed from the possibility of producing a superconductor with a high transition temperature. So far these efforts have not been successful, but have resulted in the discovery and investigation of several new compounds. The Mössbauer effect has played a prominent role in these investigations.

Dr. Wernick gave a short tour of his laboratory in which an electron beam zone refiner was in operation. Single crystals of copper and nickel were displayed. A method of gettering residual gas in diffusion ampoules using titanium strip was demonstrated. This appears to be a very useful technique. A "splat" mechanism for rapid quenching of samples used in phase studies was also demonstrated.

III-V - Compounds

Dr. C.D. Thurmond described briefly his method of growing GaP on a GaAs substrate by vapour transport using H_2O. The advantage of

this method is that it can be used at low temperatures. Once the GaP is deposited, the GaAs substrate is etched away leaving the GaP single crystal. The crystals formed are diffused with substrate impurities and used in laser investigations. The role of oxygen in the laser action is currently of great interest and is being extensively studied.

Some discussions took place on the behaviour of GaAs when annealed at high temperatures. It is well known that the normally prepared n-type material converts under these conditions to p-type when the original carrier concentration is lower than 10^{15} cm^{-3}, and this has been attributed to copper impurities migrating out of the quartz ampoule into the GaAs. Dr. Thurmond recommended the use of quartz obtained from Englehard Industries since their material appears to be better than others.

CONCLUSIONS

The Instrument Show provides users with an opportunity each year of seeing and comparing the latest in electronic and electrical equipment. The exhibits are too numerous to be successfully evaluated by one individual and careful preparation is necessary in order to obtain the maximum value from discussions. Since a number of companies have research laboratories located in the New York area, it is profitable to combine a visit to these centres with the IEEE show. An expedition of this nature is of great value to the Mineral Physics group in particular and should be established as an annual occurrence.

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